

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. R5-2005-XXXX
FOR
AIR FORCE REAL PROPERTY AGENCY
FORMER MCCLELLAN AIR FORCE BASE
IN-SITU CHEMICAL OXIDATION TREATABILITY STUDY
AT FORMER DAVIS GLOBAL COMMUNICATIONS SITE
YOLO COUNTY

This Monitoring and Reporting Program (MRP) describes requirements for monitoring during the in-situ chemical oxidation (ISCO) treatability study at the Davis Site. The ISCO treatability study will be conducted in two phases. Waste Discharge Order R5-2005-XXXX and this MRP cover the activities for Phase 1 and Phase 2. Phase 2 is expected to follow procedures similar to Phase 1. Specific details of Phase 2 will be developed using the results of Phase 1. Minor changes in Phase 2 may require revisions to the MRP. Significant changes in Phase 2, if necessary, may require a separate Order and MRP. This MRP is issued pursuant to Water Code Section 13267. The Regional Board recognizes that some changes to this monitoring program may be warranted after review of the initial post-injection monitoring data; therefore, the Discharger may request changes to the Regional Board to modify this MRP. However, the Discharger shall not implement any changes to this MRP unless and until a revised MRP is issued by the Executive Officer.

GROUNDWATER MONITORING

Prior to injection activities and baseline groundwater sampling, three new monitoring wells will be installed in the treatability test area. Two wells are planned in or immediately adjacent to the Phase 1 treatment area for the B zone. One new well is planned for the transition zone screened in the C zone.

Data will be collected during the treatability test to:

- Evaluate the effectiveness of the remedial technology at reducing contaminant concentrations.
- Evaluate impacts on secondary water quality parameters resulting from application of the remedial technology.

The treatability study groundwater monitoring program varies by location. For the treatability study, the wells are subdivided as being within the treatment zone, within the transition zone immediately downgradient of the treatment zone, and downgradient of the transition zone (compliance wells). Treatment zone wells are inside the area of expected permanganate contact. Transition zone wells are located downgradient within a 6- to 12-month travel time from the treatment zone. The compliance zone wells are farther downgradient than the transition zone wells and will be used for contingency treatment if permanganate or treatment byproducts move out of the transition zone.

Water levels will be obtained using a decontaminated down-hole probe, with an accuracy of 0.01 feet or greater. Geochemical parameters measured in the field will be collected from wells using a down-hole

water quality meter that measures temperature, ORP, pH, and conductivity. Potassium permanganate concentrations will be measured colorimetrically using a Hach colorimeter or offsite analysis.

Monitoring of the treatability study will include measurement of field parameters during each scheduled event. These parameters include water levels, oxidation-reduction potential, pH, temperature, electrical conductivity. The treatability study monitoring program is shown on Table 1, which is attached hereto and made part of this Order by reference. Field testing instruments (such as those used to test oxidation-reduction potential and conductivity) may be used provided that:

1. The operator is trained in proper use and maintenance of the instruments;
2. The instruments are field calibrated prior to each monitoring event;
3. Instruments are serviced and/or calibrated by the manufacturer at the recommended frequency; and
4. Field calibration reports are provided with the appropriate monitoring report.

All wells will be sampled using a low-flow purge and sampling technique.

Treatability Study Monitoring

Recommendations for monitoring during the treatability test are summarized in Table 1. Secondary water quality parameters included for analysis incorporate results from the bench-scale testing. The treatability study monitoring will be initiated in January 2006 and will continue through the second phase of the treatability study into 2007. Prior to the treatability study, each of the wells included in Table 1 will be analyzed for the specified parameters to establish baseline conditions during the fourth Quarter 2005. The well locations are shown on Attachment B.

The samples submitted for laboratory analyses will be analyzed by a state-certified laboratory. For groundwater samples collected from the treatment zone wells when permanganate is present, no quality control/quality assurance samples will be collected. Samples from these wells will be collected frequently as indicated in Table 1 and will require neutralization prior to the VOC analyses being performed. For groundwater samples collected from transition zone and compliance wells, all of the quality control/quality assurance protocols stipulated in the McClellan Basewide QAPP (URS, 2003) will be followed. If permanganate is present, the samples for VOC analysis will be neutralized in the field prior to shipment to the analytical laboratory. A complete analyte list with a rationale for each analysis is presented in Table 2, which is attached hereto and made part of this Order by reference.

Baseline Sampling

In order to obtain an accurate representation of baseline groundwater conditions at the site, groundwater extraction will be stopped on October 31, 2005, prior to baseline sampling and the first phase of ISCO treatability testing. (During the treatability testing, the groundwater extraction system will remain shutdown, but operable.) This will allow time for groundwater elevations, VOC concentrations, and geochemical conditions to stabilize prior to collecting baseline groundwater samples during the week of November 28, 2005, at existing wells (MW-3, MW-2, MW-4, MW-8, MWB-14, EW-1C, and MWC-14). Baseline groundwater samples will be collected from the proposed wells after installation and well development (MWB-25, MWB-26, and MWC-27). Baseline samples will be analyzed for temperature, ORP, pH, and conductivity in the field and for TDS, VOCs, dissolved metals (see Table 2), and hexavalent chromium in the laboratory.

Treatability Test Zone Wells

Subsequent to the injection, the treatability test zone wells (MW-3, MWB-25, and MWB-26 for Phase 1) will be sampled twice during the first month, and samples will be analyzed in the field for ORP, conductivity, pH, and permanganate. After the first month, the wells will be sampled monthly for two months. Samples will be analyzed for the same field parameters as during the first month. In addition, the samples will be analyzed in an offsite analytical laboratory for TDS, VOCs, and the seven dissolved metals listed in Table 1. If permanganate is present in the samples as indicated by a pink or purple color, the samples for VOC analysis will be neutralized prior to shipment to the analytical laboratory. When permanganate is present in the samples, all chromium is expected to be in the hexavalent state. However, permanganate and the neutralization procedure interfere with the hexavalent chromium analysis. Therefore, the samples will be analyzed for total chromium. In addition, the last quarterly samples for each phase of the treatability test will be analyzed for hexavalent chromium if permanganate is not present in the samples. Subsequent to the initial semi-monthly sampling, the treatment zone wells will be sampled monthly for 2 months and then quarterly until the start of the Phase 2 treatability test. At that time, it is anticipated that the treatability test zone will be expanded into Phase 2 and the sampling program will restart for these wells. In addition, wells MW-1 and MW-7 will be added to the list of treatment zone wells for Phase 2. After completion of the Phase 2 treatability test in 2007, the sampling frequency will revert to semi-annually for these wells.

Transition and Compliance Zone Wells

Monitoring in the transition and compliance zones will be accomplished through use of existing wells and one newly installed well (Table 1). The placement of the new wells, and the assignment of existing wells for monitoring these zones are based largely on the estimated groundwater flow velocities, as described below.

Groundwater Velocities as Basis for Assignment

Groundwater levels and gradients at the Davis Site fluctuate widely in direction and magnitude due to the influence of agricultural pumping in the basin. During the RI/FS, gradient measurements were collected monthly from July 1992 through July 1993. These gradients are summarized in Figure 3-4 of the RI/FS Report (CH2M HILL, 1994). This figure shows that the gradient is generally south to southwesterly during the irrigation season (May through November) and swings to the north or northeast during the winter and spring months (December through March). The gradient was flat during April 1992.

In order to estimate an average groundwater flow velocity, it is necessary to average the vectors representing the gradients for each month. Using the data presented on Figure 3-4 of the RI/FS report, the average groundwater gradient in the B zone was calculated to be 0.0029 ft/ft. The average gradient in the C zone was calculated to be about 0.0019 ft/ft. The direction of the average gradient in both B and C zones was to the southwest, which is consistent with the axis of the VOC plume. Based on short-term aquifer tests, the hydraulic conductivity of the B and C zones were estimated to range from 3 to 30 feet/day and 25 to 200 feet/day, respectively (CH2M HILL, 1994). Assuming an effective porosity of 25 percent and using the average gradients from the 1992 water year, the range of groundwater velocities would be 13 to 128 feet/year in the B zone and 68 to 547 feet/year in the C zone.

Transition Zone Wells

As indicated in Table 1, there are four existing wells and one proposed C zone well located within the transition zone for both the Phase 1 and Phase 2 treatability studies. Some impacts from the treatability studies are expected within this zone, such as detectable concentrations of permanganate, elevated ORP, or elevated secondary water quality parameter concentrations (for example, dissolved metals and TDS). Based on the velocities estimated, effects to the transition zone wells (MW-4 and MW-8) might be observed within approximately 1 year. Samples will be analyzed in the field for ORP, conductivity, pH, and permanganate, and in an offsite analytical laboratory for TDS, VOCs, and the seven dissolved metals listed on Table 1. In addition, samples will be analyzed for hexavalent chromium (if permanganate is not present in the sample) during the last quarterly monitoring event of each phase of the treatability test. Quarterly sampling will continue until the Phase 1 and 2 treatability tests are completed in 2007. At that time, the sampling frequency will revert to semi-annually.

Samples will be preserved according to the sample analysis method unless the sample is pink or purple, indicating the presence of permanganate. In the case of a pink or purple sample, permanganate will be neutralized in the field prior to analysis for VOCs. Permanganate and the neutralization agent would invalidate CrVI results; therefore, samples with visual evidence of permanganate cannot be analyzed for CrVI. However, total chromium will be analyzed. All other parameters can be analyzed in the presence of permanganate and will be handled according to the analytical method, including sample preservation and bottle selection.

Compliance Wells

As indicated in Table 1, there is one existing B zone and one existing C zone compliance well located downgradient of the transition zone. Impacts from the treatability studies are not expected at these wells. The compliance wells in the B zone are located approximately 200 feet downgradient from the Phase 1 treatment zone. Estimated travel times through the B zone to these wells, based on the velocity calculations, would range from about 1.5 to 15 years. During this time, impacts from the treatability studies are expected to dissipate as the ORP and concentrations of TDS and dissolved metals return to baseline conditions. Samples will be analyzed in the field for ORP, conductivity, pH, and permanganate, and in an offsite analytical laboratory for TDS, VOCs, and the seven dissolved metals listed in Table 1. In addition, samples will be analyzed for hexavalent chromium during the last quarterly monitoring event of each phase of the treatability test. Quarterly sampling will continue until the Phase 1 and 2 treatability tests are completed in 2007. At that time, the sampling frequency will revert to semi-annually.

QUALITY CONTROL

For quality control purposes, the Discharger shall conduct all sampling and analysis in accordance with the latest version of *Basewide Quality Assurance Project Plan, McClellan AFB*. All samples shall be representative of the volume and nature of the discharge and matrix of the sampled media.

REPORTING

The treatability study schedule is summarized in Table 3, which is attached hereto and made part of this Order by reference. The Phase 1 ISCO field work is scheduled to be completed 22 June 2006. Within 60 days after completion of the Phase 1 ISCO treatability study, the Discharger shall submit a Draft Phase 1 Treatability Study Report/Phase 2 Addendum to the Regional Board. At a minimum, the Phase 1 Treatability Study Report/Phase 2 Addendum shall include:

1. A summary of the implementation of the Phase 1 study, describing primarily any deviations from the scope described in this Order.
2. Key findings of site characterization actions, with emphasis on findings that impacted or caused any deviation to implementation of the Phase 1 treatability study.
3. A summary of key findings of the Phase 1 treatability study.
4. Proposed changes to plans for implementation of the Phase 2 treatability study.
5. Tabulated analytical data for each monitoring event.
6. Site map with all monitoring wells, groundwater flow direction, and other pertinent site features.

7. Discussion of compliance record with Waste Discharge Order R5-2005-XXXX and any corrective actions taken or planned.
8. Copies of all laboratory analytical report(s).

The Discharger shall submit a Feasibility Study Addendum to the Regional Board no later than 1 December 2007 after completion of the Phase 2 treatability study. The Feasibility Study Addendum shall contain both tabular and graphical summaries of all monitoring data obtained during the treatability study, including the evaluations described in Provision D5 of Order R5-2005-XXXX. The results of any monitoring done more frequently than required at the locations specified in the Monitoring and Report Program shall also be reported to the Regional Board. In addition, the Discharger shall discuss the compliance record and the corrective actions taken or planned which may be needed to bring the discharge into full compliance with these waste discharge requirements. The report shall include:

1. Results of groundwater monitoring.
2. A narrative description of all preparatory, monitoring, sampling, and analytical testing activities for the groundwater monitoring. The narrative shall be sufficiently detailed to verify compliance with the WDR, this MRP, and the Standard Provisions and Reporting Requirements. The narrative shall be supported by field logs for each well documenting depth to groundwater; parameters measured before, during, and after purging; method of purging; calculation of casing volume; and total volume of water purged;
3. Calculation of groundwater elevations, an assessment of groundwater flow direction and gradient on the date of measurement, comparison of previous flow direction and gradient data, and discussion of seasonal trends if any;
4. A narrative discussion of the analytical results for all groundwater locations monitored including spatial and temporal trends, with reference to summary data tables, graphs, and appended analytical reports (as applicable);
5. A comparison of monitoring data to applicable groundwater limitations;
6. Summary data tables of historical and current water table elevations and analytical results;
7. A scaled map showing relevant structures and features of the facility, the locations of monitoring wells and any other sampling stations, and groundwater elevation contours referenced to mean sea level datum; and
8. Copies of laboratory analytical report(s) for groundwater monitoring.

A letter of transmittal shall accompany the Draft Phase 1 Treatability Study Report/Phase 2 Addendum and Feasibility Study Addendum. Such a letter shall include a discussion of requirement violations found during the reporting period, and actions taken or planned for correcting noted violations, such as operation or facility modifications. If the discharger has previously submitted a report describing corrective actions and/or a time schedule for implementing the corrective actions, reference to the

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previous correspondence will be satisfactory. The transmittal letter shall contain a statement by the discharger, or the discharger's authorized agent, under penalty of perjury, that to the best of the signer's knowledge the report is true, accurate and complete.

Ordered by: _____
THOMAS R. PINKOS, Executive Officer

(Date)

11/1/05 JDT